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RHYTHM PUZZLE - ANSWER

Rapid palpitations: three of a kind?

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The first part of the ECG shows a wide QRS tachycardia with a right bundle branch block (RBBB) morphology, an inferior axis and a heart rate of 240 bpm (tachycardia cycle length (TCL) of 250 ms). The middle part shows a narrow QRS tachycardia with an intermediate axis and the same heart rate of 240 bpm (TCL 250 ms). In the last part a wide QRS tachycardia is observed, although with a different, left bundle branch block (LBBB) morphology and horizontal axis. The heart rate decreased slightly to 195 bpm (TCL 310 ms). In the middle part, during tachycardia with a narrow QRS complex, a P wave can be suspected on top of the T wave with an RP interval longer than the PR. Especially leads aVR, lead I and the inferior leads permit the visualisation of the P waves. The morphology of the P wave is difficult to see, but a negative polarity in the inferior leads and positive polarity in aVR suggest the presence of a retrograde P wave. The differential diagnosis will be: orthodromic atrioventricular reentrant tachycardia (AVRT), atypical or fast-slow atrioventricular nodal reentrant tachycardia (AVNRT), or atrial tachycardia (AT). The pattern of QRS alternans during the narrow QRS tachycardia points towards the direction of an AVRT, although it does not rule out AT or AVNRT. The clue to the diagnosis is the change in QRS morphology during the ongoing tachycardia. During tachycardia with RBBB morphology, the same TCL as during the narrow QRS tachycardia is seen (250 ms). In contrast, changing to LBBB the tachycardia slows down with a TCL of 310 ms. In case of an AVNRT or AT the ventricles are not part of the reentrant circuit, so a conduction block in either of the bundle branches would not influence the heart rate. The fact that the heart rate slows during LBBB means that the slowed conduction towards the left ventricle influences the cycle length and proves that the ventricle is part of the circuit and an orthodromic AVRT using a left-sided accessory pathway (AP) is proven. The fact that during RBBB the heart rate remains unchanged confirms the diagnosis of the left-sided AP (Fig. 2). During the electrophysiology study the AP was located lateral on the mitral annulus and was successfully ablated. Afterwards no tachycardia could be induced.

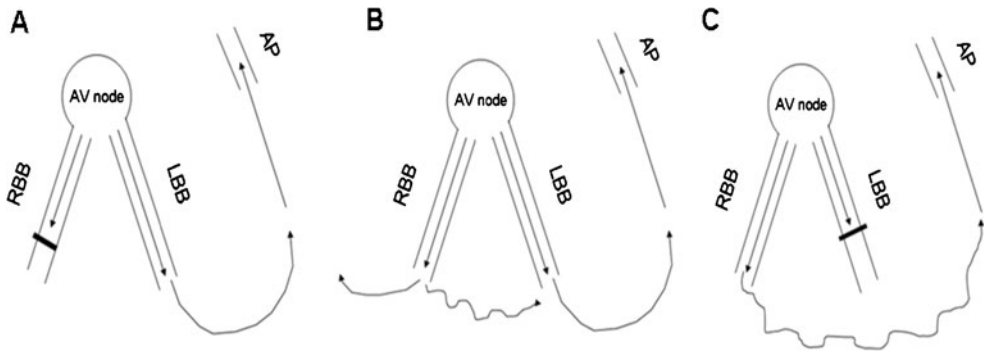

Fig. 2 **a**. AV conduction with RBBB does not influence the conduction time to the retrograde conducting AP. **b**. AV conduction without bundle blanch block. **c**. During LBBB the conduction time over the ventricle is longer because of the delayed right to left conduction over the interventricular septum, so the TCL will be longer. *RBB* right bundle branch, *LBB* left bundle branch and *AP* accessory pathway

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